UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/773,017 | 02/05/2004 | Joseph Z. Lu | I20 06798US | 5322 |

128 7590 07/17/2006

HONEYWELL INTERNATIONAL INC.
101 COLUMBIA ROAD
P O BOX 2245
MORRISTOWN, NJ 07962-2245

| EXAMINER | |
|---|---|
| LO, SUZANNE | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2128 | |

DATE MAILED: 07/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/773,017 | LU, JOSEPH Z. | |
| | Examiner | Art Unit | |
| | Suzanne Lo | 2128 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *05 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## *DETAILED ACTION*

1. Claims 1-27 have been presented for examination.

### *Claim Rejections - 35 USC § 101*

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 1-27 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Specifically the claims do not produce a tangible result. The claims do not enable their usefulness to be realized, there is only calculation, generation, and decomposition of matrices and projections and there is no display or tangible output the matrices or projections.

### *Claim Rejections - 35 USC § 112*

**The following is a quotation of the second paragraph of 35 U.S.C. 112:**

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 10, 12, 18, 26 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "at least substantially" in claims 1, 12, 18, and 26 is a relative term which renders the claims indefinite. The term "at least substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The phrase "at least one of white noise and colored noise" in claim 10 renders the claim indefinite. It is unclear whether a disturbance comprises at least one of white noise or colored noise or the disturbance comprises a combination of white noise and colored noise. It is also unclear whether

Applicant defines colored noise as all possible types of noise, all possible named color types of noise (white, pink, blue, brown), or all possible named color types of noise not including white noise. Examiner interprets the phrase as at least one of white noise or colored noise.

## *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claims 1, 4, 18, 21 and 26 are rejected** under 35 U.S.C. 102(e) as being clearly anticipated by **Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1).**

**As per claim 1,** Kadambe is directed to a method, comprising: receiving a matrix comprising a first plurality of samples associated with a first signal and a second plurality of samples associated with a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)**; and projecting the matrix so as to at least substantially separate the first portion of the second signal from the second portion of the second signal **([0021], estimate matrix S)**.

**As per claim 4,** Kadambe is directed to the method of claim 1, wherein projecting the matrix comprises projecting the first signal along with the second signal **([0021])**.

**As per claim 18,** Kadambe is directed to a computer program embodied on a computer readable medium and operable to be executed by a processor, the computer program comprising computer readable

program code for method steps with the same limitations as claim 1 and is therefore rejected over the same art.

**As per claim 26**, Kadambe is directed to a system, comprising: a monitored system **(Figure 3, 300, Data Processing System)** operable to receive a first signal and provide a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)**; and a controller **(Figure 3, 306, signal processor)** operable to: produce a matrix comprising a first plurality of samples associated with the first signal and a second plurality of samples associated with the second signal **([0021], mixed signal matrix X)**; and decompose the matrix so as to form a projection, the projection at least substantially separating the first portion of the second signal from the second portion of the second signal **([0021], estimate matrix S)**.

5. **Claim 27 is rejected** under 35 U.S.C. 102(e) as being clearly anticipated by **Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1).**

**As per claim 27**, Repucci is directed to a method, comprising: performing canonical QR-decomposition on a matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix **([0010], [0073], page 8, [0101])**; wherein the upper triangular matrix has a plurality of values along a diagonal of the upper triangular matrix, each value being greater than or equal to zero, the diagonal lying between an upper left corner and a lower right corner of the upper triangular matrix as these limitations are the inherent to an upper triangular matrix from a canonical QR-decomposition.

## *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claims 2-3, 11-13, and 19-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) **in view of Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1).**

**As per claim 2**, Kadambe is directed to the method of claim 1, but fails to specifically disclose wherein projecting the matrix comprises performing canonical QR-decomposition on the matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix.

Repucci teaches projecting a matrix by performing canonical QR-decomposition on the matrix with an orthogonal matrix and an upper triangular matrix (**[0010], [0073], page 8, [0101]**). Kadambe and Repucci are analogous art because they are from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix projection method of Repucci in order to minimize error in the modeled signals (**Repucci, page 8, [0101]**).

**As per claim 3**, the combination of Kadambe and Repucci already discloses the method of claim 2, wherein: the upper triangular matrix has a plurality of values along a diagonal of the matrix, each value

being greater than or equal to zero; and the diagonal lies between an upper left corner and a lower right corner of the upper triangular matrix as the limitations are the inherent to an upper triangular matrix from a canonical QR-decomposition.

**As per claim 11**, Kadambe is directed to an apparatus, comprising: at least one memory operable to store a matrix comprising a first plurality of samples associated with a first signal and a second plurality of samples associated with a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)** but fails to disclose and at least one processor operable to perform canonical QR-decomposition on the matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix, the upper triangular matrix having a plurality of values along a diagonal of the matrix, each value being greater than or equal to zero, the diagonal lying between an upper left corner and a lower right corner of the upper triangular matrix.

Repucci teaches projecting a matrix by performing canonical QR-decomposition on the matrix with an orthogonal matrix and an upper triangular matrix **([0010], [0073], page 8, [0101])**. Kadambe and Repucci are analogous art because they are from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix projection method of Repucci in order to minimize error in the modeled signals **(Repucci, page 8, [0101])**.

**As per claim 12**, the combination of Kadambe and Repucci already discloses the apparatus of claim 11, wherein performing the canonical QR-decomposition **(Repucci, [0010], [0073], page 8, [0101])** allows the at least one processor to project the matrix so as to at least substantially separate the first portion of the second signal from the second portion of the second signal **(Kadambe, [0021], estimate matrix S)**.

**As per claim 13**, the combination of Kadambe and Repucci already discloses the apparatus of claim 12, wherein the at least one processor is operable to generate a projection that includes the first signal, the first portion of the second signal, and the second portion of the second signal **(Kadambe, [0021], estimate matrix S)**.

**As per claims 19-20**, the combination of Kadambe and Repucci is directed to a computer program embodied on a computer readable medium and operable to be executed by a processor, the computer program comprising computer readable program code for method steps with the same limitations as claims 2-3 and are therefore rejected under the same art combination.

7. **Claims 5-7 and 22-23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) **in view of Ku et al. ("Preconditioned Iterative Methods for Solving Toeplitz-Plus-Hankel Systems")**.

**As per claim 5**, Kadambe is directed to the method of claim 1, but fails to specifically disclose further comprising generating the matrix by: forming a first column Hankel matrix in a first portion of the matrix; and forming a second column Hankel matrix in a first portion of the matrix. Ku teaches forming two column Hankel matrices in a matrix **(page 109, Introduction, 2nd column, 1st paragraph)**. Kadambe and Ku are analogous art because they are from the same field of endeavor, solving linear equation systems. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix generation method of Ku in order to reduce computation complexity and have a stable convergence performance **(Ku, page 109, Introduction, 1st column, 1st paragraph)**.

**As per claim 6**, the combination of Kadambe and Ku already discloses the method of claim 5, wherein: the first column Hankel matrix comprises a backward column Hankel matrix; and the second

column Hankel matrix comprises a forward column Hankel matrix **(Ku, page 109, Introduction, 2nd column, 1st paragraph)**.

**As per claim 7**, the combination of Kadambe and Ku already discloses the method of claim 5, wherein: the first column Hankel matrix comprises one of a backward column Hankel matrix and a forward column Hankel matrix; and the second column Hankel matrix comprises one of a backward column Hankel matrix and a forward column Hankel matrix **(Ku, page 109, Introduction, 2nd column, 2nd paragraph)**.

**As per claims 22-23**, the combination of Kadambe and Ku is directed to a computer program embodied on a computer readable medium and operable to be executed by a processor, the computer program comprising computer readable program code for method steps with the same limitations as claims 5-6 and are therefore rejected under the same art combination.

8. **Claims 8-10 and 24-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) **in view of Bechhoefer et al. (U.S. Patent Application Publication No. 2003/0004658 A1).**

**As per claim 8**, Kadambe is directed to the method of claim 1, but fails to specifically disclose wherein the matrix comprises a first matrix, the first matrix containing a first segment of samples; and further comprising: receiving a second matrix containing a second segment of samples; concatenating the second matrix with an upper triangular matrix associated with the first matrix to form a concatenated matrix; and projecting the concatenated matrix. Bechhoefer teaches concatenating the second matrix with an upper triangular matrix and projecting the resultant matrix **(page 2, [0011], "solving possible values for adjustment")**. Kadambe and Bechhoefer are analogous art because they are both from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill

in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix projection method of Bechhoefer in order to provide adjustments to reduce disturbances **(Bechhoefer, [0003])**.

**As per claim 9**, the combination of Kadambe and Bechhoefer already discloses the method of claim 8, wherein concatenating the second matrix with the upper triangular matrix comprises multiplying values in the upper triangular matrix by a forgetting factor **(Bechhoefer, page 2, [0011], "solving possible values for adjustment" and [0130])**.

**As per claim 10**, the combination of Kadambe and Bechhoefer already discloses the method of claim 8, wherein the at least one disturbance comprises at least one of white noise and colored noise **(Kadambe, [0186])**.

**As per claims 24-25**, the combination of Kadambe and Bechhoefer is directed to a computer program embodied on a computer readable medium and operable to be executed by a processor, the computer program comprising computer readable program code for method steps with the same limitations as claims 8-9 and are therefore rejected under the same art combination.

**9. Claims 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) and Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1) **in view of Ku et al. ("Preconditioned Iterative Methods for Solving Toeplitz-Plus-Hankel Systems")**.

**As per claim 14**, the combination of Kadambe and Repucci is directed to the apparatus of claim 11, but fails to specifically disclose wherein the at least one processor is further operable to generate the matrix by: forming a first column Hankel matrix in a first portion of the matrix; and forming a second

column Hankel matrix in a first portion of the matrix. Ku teaches forming two column Hankel matrices in a matrix **(page 109, Introduction, 2nd column, 1st paragraph)**. Kadambe, Repucci, and Ku are analogous art because they are all from the same field of endeavor, solving linear equation systems. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe and Repucci with the matrix generation method of Ku in order to reduce computation complexity and have a stable convergence performance **(Ku, page 109, Introduction, 1st column, 1st paragraph)**.

**As per claim 15**, the combination of Kadambe, Repucci, and Ku already discloses the apparatus of claim 14, wherein: the first column Hankel matrix comprises a backward column Hankel matrix; and the second column Hankel matrix comprises a forward column Hankel matrix **(page 109, Introduction, 2nd column, 1st paragraph)**.

**10.** **Claims 16-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) and Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1) **in view of Bechhoefer et al. (U.S. Patent Application Publication No. 2003/0004658 A1).**

**As per claim 16**, the combination of Kadambe and Repucci is directed to the apparatus of claim 11, but fails to specifically disclose wherein: the matrix comprises a first matrix, the first matrix containing a first segment of samples; and the at least one processor is further operable to: receive a second matrix containing a second segment of samples; concatenate the second matrix with an upper triangular matrix associated with the first matrix to form a concatenated matrix; and perform canonical QR-decomposition on the concatenated matrix. Bechhoefer teaches concatenating the second matrix with an upper triangular matrix and projecting the resultant matrix **(page 2, [0011], "solving possible values for adjustment")**. Kadambe, Repucci, and Bechhoefer are analogous art because they are all from the

same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe and Repucci with the matrix projection method of Bechhoefer in order to provide adjustments to reduce disturbances **(Bechhoefer, [0003])**.

**As per claim 17**, the combination of Kadambe, Repucci, and Bechhoefer already discloses the apparatus of claim 16, wherein the at least one processor is further operable to multiply values in the upper triangular matrix by a forgetting factor **(Bechhoefer, page 2, [0011], "solving possible values for adjustment" and [0130])**.

***Conclusion***

11. The prior art made of record is not relied upon because it is cumulative to the applied rejection. These references include:

1. U.S. Patent No. 6,615,164 B1 issued to Gopisetty et al. on 09/02/03.

2. U.S. Patent Application Publication 2004/0071207 A1 issued to Skidmore et al. on 04/16/04.

3. U.S. Patent No. 7,035,357 B2 issued to Bonhomme on 04/25/06.

12. All Claims are rejected.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suzanne Lo whose telephone number is (571)272-5876. The examiner can normally be reached on M-F, 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2297. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Suzanne Lo
Patent Examiner
Art Unit 2128

SL
07/09/06

KAMINI SHAH
SUPERVISORY PATENT EXAMINER